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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte AKIO TOSAKA,
SINJIRO KANEKO,
YOICHI TOMINAGA,
NORIYUKI KATAYAMA,
NOBUTAKA KUROSAWA,
KEI SAKATA, and
OSAMU FURUKIMI

Appeal 2008-3027
Application 09/937,889
Technology Center 1700

Decided: December 10, 2008

Before CHUNG K. PAK, THOMAS A. WALTZ, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1 through 5, 10, 12, and 14 through 19, all of the pending claims in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

The subject matter on appeal is directed to high tensile strength hot-rolled steel sheets (Spec. 1, ll. 1-11). Details of the appealed subject matter are recited in representative independent claims 1, 2, 10, 12, and 16 reproduced below[1]:

1. A high tensile strength hot-rolled steel sheet having superior strain aging hardenability comprising: in percent by mass,

0.15% or less of C;

0.45% or less of Si;

3.0% or less of Mn;

0.08% or less of P;

0.02% or less of S;

less than 0.02% of A1;

0.0050% to 0.0250% of N; and

the balance being Fe and incidental impurities,

the ratio N (mass%)/A1(mass%) being 0.3 or more,

N in the dissolved state being 0.0030% or more, wherein the hot-rolled steel sheet has a ferrite phase with an average grain size of 10μm or less.

2. A high tensile strength hot-rolled steel sheet having superior strain aging hardenability with a tensile strength of 440 MPa or more comprising: in percent by mass,

[1] To the extent that Appellants have presented substantive arguments for separate patentability of any individual claims on appeal, we will address them separately consistent with 37 C.F.R. § 41.37(c)(1)(vii) (2005).

0.15% or less of C;

0.45% or less of Si;

3.0% or less of Mn;

0.08% or less of P;

0.02% or less of S;

less than 0.02% of A1;

0.0050% to 0.0250% of N; and

the balance being Fe and incidental impurities,

the ratio N (mass%)/A1 (mass%) being 0.3 or more, N in the dissolved state being 0.0030% or more,

wherein the hot-rolled steel sheet has a structure in which the areal rate of the ferrite phase having an average grain size of 10 μm or less is 50% or more.

10. A high tensile strength hot-rolled steel sheet having superior strain aging hardenability with a BH of 80 MPa or more, a ΔTS of 40 MPa or more, and a tensile strength of 440 MPa or more comprising, in percent by mass,

0.15% or less of C;

0.45% or less of Si;

3.0% or less of MN;

0.08% or less of P;

0.02% or less of S;

less than 0.02% of A1;

0.0050% to 0.0250% of N; and

the balance being Fe and incidental impurities,

the ratio N (mass%)/A1(mass%) being 0.3 or more, N in the dissolved state being 0.0030% or more,

wherein the hot-rolled steel sheet has a structure in which the areal rate of the ferrite phase having an average grain size of 10 μm or less is 70% or more, and the areal rate of the martensite phase is 5% or more.

12. A high tensile strength hot-rolled steel sheet having superior strain aging hardenability comprising: in percent by mass,

0.03% to 0.1% of C;

0.45% or less of Si;

1.0% to 3.0% of Mn;

0.08% or less of P;

0.02% or less of S;

less than 0.02% of A1;

0.0050% to 0.0250% of N;

0.1% or less in total of at least one of more than 0.02% to 0,1% of Nb and more than 0.02% to 0.1% of V; and

the balance being Fe and incidental impurities,

the ratio N (mass%)/A1 (mass%) being 0.3 or more,

N in the dissolved state being 0.0030% or more,

the total of precipitated Nb and precipitated V being 0.015% or more,

wherein the hot-rolled steel sheet has a structure in which the areal rate of the ferrite phase having an average grain size of 10 μm or less is 80% or more, and the average grain size of a precipitate comprising a Nb carbonitride or a V carbonitride is 0.05 μm or less.

16. A steel sheet according to claim 1, wherein the ratio N/A1 is 0.6 or more.

As evidence of unpatentability of the appealed subject matter, the Examiner proffered the following prior art references:

Maid	US 4,790,889	Dec. 13, 1988
Tosaka	US 5,074,926	Dec. 24, 1991

The Examiner rejected the claims on appeal as follows:

1) Claims 1 through 5, 10, 12, and 14 through 19 under 35 U.S.C. § 112, first paragraph, as failing to provide written descriptive support for the presently claimed subject matter; and

2) Claims 1 through 5, 10, 12, and 14 through 19 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Maid and Tosaka.

Appellants appeal from the Examiner's decision rejecting the claims on appeal under 35 U.S.C. § 112, first paragraph, and 35 U.S.C. § 103(a).

1. WRITTEN DESCRIPTION UNDER 35 U.S.C. § 112

ISSUES

Does the application disclosure, as originally filed, reasonably convey to one of ordinary skill in the art that the inventors, at the time the

application was filed, had possession of the later claimed limitations "0.045 or less of Si" and "N in the dissolved state being 0.0030% or more" in claims 1, 2, 10, and 12 as required by the written description requirement of the first paragraph of 35 U.S.C. § 112?

Does the application disclosure, as originally filed, reasonably convey to one of ordinary skill in the art that the inventors, at the time the application was filed, had possession of the later claimed limitation "the ratio N/Al is 0.6 or more" in claims 16 through 19 as required by the written description requirement of the first paragraph of 35 U.S.C. § 112?

RELEVANT FACTUAL FINDINGS (FF)

The Factual Findings set forth below are supported by a preponderance of the evidence:

1. Claims 1, 2, 10 and 12, as originally filed, recite a high tensile strength hot-rolled steel sheet having, *inter alia*, "2.0% or less of Si" and "N in the dissolved state being 0.0010 or more."

2. Original claim 1, 2, 10, and 12 were amended to include the limitations "0.45% or less of Si" and "N in the dissolved state being 0.003% or more" (*See, e.g.*, the Amendment dated September 28, 2005 and the Amendment dated May 26, 2006).

3. The Specification broadly describes Appellants' high tensile strength hot-rolled steel sheets having "2.0% or less" of Si (p. 16, l. 13).

4. The Specification exemplifies Appellants' high tensile strength hot-rolled sheets having Si contents 0.45%, 0.35%, 0.25%, and 0.15%, respectively (p. 52, Table 1).

5. The Specification describes that "the amount of dissolved N is preferably set at 0.0030% or more" (p. 22, ll. 17-18).

6. Newly added claims 16 through 19 recite the limitation "the ratio N/Al is 0.6 or more" (the amendment dated May 26, 2006).

7. Original claims 1, 2, 10, and 12 recite "the ratio N (mass%)/Al (mass%) being 0.3 or more."

8. The Specification describes that Appellants' high tensile strength hot-rolled sheets have a N/Al (a ratio between the N amount and the Al amount) of 0.3 or more (p. 22, ll. 19-20).

9. The Specification exemplifies high tensile strength hot-rolled sheets having N/Al ratios of 0.08, 0.31, 0.86, 1.09, 1.27, 1.76, 2.36, and 3.48, 3.50, 3.55, and 3.63 (p. 52, Table 1).

10. Appellants argue that claims 16 through 19 are separately patentable over the prior art because they recite a different N/Al ratio than the one recited in independent claims 1, 2, 10, and 12, thus implying the invention recited in claims 16 through 19 is patentably different from the invention recited in claims 1, 2, 10 and 12 (App. Br. 15-16).

PRINCIPLES OF LAW

Under 35 U.S.C. § 112, first paragraph:

> [t]he test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subjected matter, rather than the presence or absence of literal support in the specification for the claim language. [*See In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983).]

Although the later claimed subject matter need not be expressed in *ipsis verbis* in the application disclosure as originally filed, it is nonetheless necessary that the written description of the application, as originally filed, must clearly allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed. *In re Gosteli*, 872 F.2d 1008, 1012 (Fed. Cir. 1989); *In re Wertheim*, 541 F.2d 257, 265 (CCPA 1976). To that end, the later claimed range can be derived from the broad and the exemplified embodiments described in the original disclosure. *Wertheim,* 541 F.2d at 265. For example, *Wertheim* held that the later claimed range of "35-60%" can be derived from an originally filed application disclosing the broader range "25%-60%," along with two examples showing 36% and 50%, respectively without violating the written description requirement of the first paragraph of 35 U.S.C. § 112. *Id.* at 265. Moreover, the broadly described range itself may provide written descriptive support for a narrow range within the broadly described range, provided that the broadly described range is not a different invention than the narrow range. *Id.* at 264-65. Specifically, *Wertheim* stated that:

> Where it is clear, for instance, that the broad[ly] described range pertains to a different invention than the narrower (and subsumed) claimed range, then the broader range does not describe the narrow range. [Citation omitted.]
> *Id.* at 265.

Whether the issues raised involve ranges or something else, "[t]he primary consideration is factual…" *Wertheim*, 541 F.2d at 262.

ANALYSES AND CONCLUSIONS OF LAW

The Specification, as originally filed, describes Appellants' high tensile strength hot-rolled steel sheets having a Si content of 2.0% or less, which generically include the now claimed high tensile strength hot-rolled steel sheets having a Si content of 0.45% or less. In addition to the generic description of the Si content, the original Specification exemplifies Appellants' high tensile strength hot-rolled sheets having Si contents of 0.45%, 0.35%, 0.25%, and 0.15%, respectively. Thus, the original Specification, as a whole, reasonably conveys to a person having ordinary skill in the art that the inventors had possession of the now claimed high tensile strength hot-rolled steel sheets having a Si content of 0.45% or less in claims 1, 2, 10, and 12. As held in *Wertheim,* 541 F.2d at 265, the later claimed range can be derived from the combination of the broad and the exemplified embodiments described in the original disclosure.

The Specification further describes that "the amount of dissolved N is preferably set at 0.0030% or more" which literally corresponds to the now claimed amount of dissolved N in claim 1. There is nothing in the record to show that this literal description of the claimed amount of dissolved N does not reasonably convey to a person having ordinary skill in the art that the inventors had possession of the now claimed steel sheets having the amount of dissolved N recited in claims 1, 2, 10, and 12.

Accordingly, we concur with Appellants that the application disclosure, as originally filed, reasonably conveys to one of ordinary skill in the art that the inventors, at the time the application was filed, had possession of the later claimed limitations "0.045 or less of Si" and "N in the

dissolved state being 0.0030% or more" in claim 1 as required by the written description requirement of the first paragraph of 35 U.S.C. § 112.

The N/Al ratio newly recited in claims 16 through 19, however, is on different footing. The Specification, as originally filed, describes a high tensile strength hot-rolled steel sheet having a N/Al ratio of 0.3 or more and exemplifies high tensile strength hot-rolled steel sheets having N/Al ratios of 0.86 or more. Nowhere does the original Specification exemplify or describe a newly inserted arbitrary N/Al ratio of about 0.6 or more as now claimed in claims 16 through 19. While the originally described N/Al ratio of 0.3 or more generically includes the now claimed arbitrary narrow N/Al ratio of 0.6 or more, there is nothing in the record to indicate that such arbitrary narrow N/Al ratio does not introduce a different invention. In fact, Appellants, by arguing the separate patentablility of the narrow N/Al ratio of 0.6 or more recited in claims 16 through 19, acknowledge that the high tensile strength hot-rolled steel sheet having such narrow ratio recited in claims 16 through 19 constitutes a different invention than the one having the originally described broader N/Al ratio of 0.3 or more recited in claims 1, 2, 10, and 12. As stated in *Wertheim*, 541 F.2d at 265:

> Where it is clear, for instance, that the broad[ly] described range pertains to a different invention than the narrower (and subsumed) claimed range, then the broader range does not describe the narrower range.

Accordingly, we concur with the Examiner that the application disclosure, as originally filed, does not reasonably convey to one of ordinary skill in the art that the inventors, at the time the application was filed, had possession of the later claimed limitation "the ratio N/Al is 0.6 or more" in

claims 16 through 19 as required by the written description requirement of the first paragraph of 35 U.S.C. § 112.

2. OBVIOUSNESS

ISSUES

Have Appellants identified reversible error in the Examiner's determination that Maid, as explained by Tosaka, would have taught and/or suggested the contents of Si and dissolved N, and the average grain size of ferrite phase recited in claim 1, 2, 10, and 12 within the meaning of 35 U.S.C. § 103(a)?

Have Appellants identified reversible error in the Examiner's determination that Maid, as explained by Tosaka, would have taught and/or suggested the N/Al ratio recited in claims 16 through 19 within the meaning of 35 U.S.C. § 103(a)?

If Appellants fail to show reversible error in any of the above determinations made by the Examiner, have Appellants demonstrated that the claimed subject matter as a whole imparts unexpected results, thereby rebutting any prima facie case of obviousness established by the Examiner?

RELEVANT FACTUAL FINDINGS (FF)

The Factual Findings set forth below are supported by a preponderance of the evidence:

11. Maid discloses hot-rolled steel strips produced from steels containing 0.05 to 0.16% of C, 0.5 to 1.0% of Si, 0.3 to 1.5% of Cr, less than or equal to 0.025% of P, less than or equal to 0.015% of S, 0.02 to 0.1% of Al, less than

or equal to 0.011% of N, 0.2 to 0.4% of Mn, and the remainder being iron and usual impurities (col. 2, ll. 48-52).

12. It can be inferred from Maid that its hot-rolled steel strips have N/Al weight ratios from 0.11 (0.011% of N/ 0.1% of Al) to 0.55 (0.011% of N/0.02% of Al). *Id.*

13. The Si content of 0.5% and N/Al ratio of 0.55 described in Maid are very close to the Si content of less than 0.45 recited in claims 1,2, 10, and 12 and the N/Al ratio of 0.6 or more recited in claims 16 through 19 (*Compare* Maid, col. 2, ll. 48-52, *with* claims 1, 2, 10, 12, and 16 through 19).

14. Appellants state that "0.88 N/Al ratio is relatively close to 0.6 [N/Al] ratio" (App. Br. 10).

15. Maid discloses employing less than or equal to 0.011% of N, which according to page 20 of the Specification, provides the claimed amount of N in dissolved state (Maid, col. 2, l. 51 and Spec. 20, ll. 5-15).

16. The Specification states (p. 20, ll. 5-15):

> N: 0.0050% to 0.0250%
>
> N is the most important constituent element in the present invention. That is, by the addition of an appropriate amount of N to control the production conditions, it is possible to secure a necessary and sufficient amount of N in the dissolved state in the mother plate (as hot rolled). Thereby, the effect of an increase in strength (YS, TS) due to solid-solution strengthening and strain aging hardening is satisfactorily exhibited, and it is possible to stably satisfy the mechanical property conditions of the steel sheet of the present invention, i.e., TS of 440 MPa or more, BH of 80 MPa or more, and ΔTS of 40 MPa or more. N also decreases the Ar_3 transformation temperature.

17. Maid teaches that the hot-rolled steel strips have dual-phase structures "composed of fine-grained, globular ferrite (>80%) and martensite grains dispersed therein" with "tensile strengths of 500 to 600 N/mm^{2}" (col. 3, ll. 32-34 and col. 4, ll. 29-32).

18. Maid teaches that its hot-rolled steel strips are "suitable for the production of components which require high cold workability" (col. 4, ll. 33-34).

19. Tosaka, which is drawn to high tensile cold-rolled steel sheets (the steel sheet art), explains that "fine" ferrite grains, such as those taught by Maid, are inclusive of grains having a mean grain diameter of 20 micrometers or less (col. 4, ll. 24-27 and 54-56).

20. Maid expressly or inherently teaches the amounts of Al and dissolved N corresponding to the claimed amounts of Al and dissolved N which, according to Appellants, are significantly related to the size of ferrite grains. Specifically, Appellants assert that "there is a significant correlation between the amount of Al, the amount of dissolved N and the size of ferrite grains" (App. Br. 18 and FF 10-15).

21. As a rebuttal to the prima facie case established by the Examiner, Appellants rely on Exhibit 1 and Figures 1 through 3 which are said to be developed from Tables 3 and 16 in the Specification to show unexpected results (e.g., App. Br 27-31).

22. In the Evidence Appendix section, Appellants state that they are not relying on any evidence and do not provide copies of Exhibit 1 and Figures 1 through 3 derived from Tables 3 and 16.

23. Appellants do not provide a statement setting forth where in the record that evidence was entered in the record by the Examiner in the Evidence Appendix section.

24. The hot-rolled steel sheets listed in Tables 3 and 16 have various thicknesses and are produced from various steel alloy compositions under various processing temperatures (*See* Specification 42-53. especially Tables 1-3 and 14-16).

25. The steel sheets listed in Tables 3 and 16, for example, have 0.03 to 0.08% C, 0.01 to 0.45% Si, 0.9 to 2.00% Mn, 0.001 to 0.005% S, 0.004 to 0.045% P, 0.004 to 0.017% Al, and 0.001 to 0.02% N, and optionally Nb and V, with a N/Al ratio of 0.08 to 3.63 (Specification, Tables 1-3 and 14-16).

26. The steel sheets listed in Tables 3 and 16 are said to have unknown proportions of at least two phases selected from ferrite, pearlite, bainite, and martensite.

27. Table 16 shows that its hot-rolled steel sheets further have 0.0002 to 0.0155 dissolved N, 0.009 to 0.08% of Nb and V, an areal rate of ferrite phase from 78 to 97%, an average ferrite grain size of 5.5 to 11.8 micrometers, and an average Nb or V carbonitride grain size of 0.02 to 0.28 micrometers.

28. According to Appellants, the claimed invention is shown to unexpectedly increase yield point (BH) and tensile strength after aging (ΔTS) (App Br. 27-31).

29. Appellants have not shown that any factual evidence in Tables 3 and 16 demonstrates that the claimed features relied upon are attributable to the

alleged unexpectedly increased BH and ΔTS properties of hot-rolled steel sheets (App. Br. 27-31 and Reply Br. 4-5).

30. It is not clear from Tables 3 and 16 that the allegedly improved BH and ΔTS are due to the unclaimed different proportions of different phases in hot-rolled steel sheets, the claimed average grain sizes of the ferrite phases of hot-rolled steel sheets, the claimed N/Al ratios in hot-rolled steel sheets, the unclaimed different areal rates of ferrite phase in hot-rolled steel sheets, the unclaimed processing temperatures used to produce hot-roll steel sheets, the unclaimed amounts of Nb and V precipitated as NB and V carbonitrides and the unclaimed average Nb or V carbonitride grain sizes.

31. The cause-and–effect relationship, which Appellants desire to show between the claimed features, such as the claimed average ferrite grain size, the claimed amount of dissolved N, and the claimed N/Al ratio, and the allegedly improved BH and ΔTS properties of hot-rolled steel sheets, is lost in multiple unfixed variables (Tables 3 and 16 in the Specification).

32. Appellants have not demonstrated that the allegedly improved BH and ΔTS properties of hot-rolled steel sheets are based on a comparison between the claimed invention and the closest prior art, Maid (App Br.).

33. Appellants have not explained which comparative examples and why such comparative examples in Tables 3 and 16 are representative of the closest prior art, Maid.

34. Appellants have not demonstrated that the showing in Tables 3 and 16 is reasonably commensurate in scope with the degree of protection sought by the claims on appeal.

35. While the showing in Tables 3 and 16 are limited to few specific steel sheet compositions produced under particular processing conditions, the claims are not so limited.

PRINCIPLES OF LAW

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations, if any. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). "[A]nalysis [of whether the subject matter of a claim would have been prima facie obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l Co., v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-41 (2007)); *see also DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1361 (Fed. Cir. 2006) ("The motivation need not be found in the references sought to be combined, but may be found in any number of sources, including common knowledge, the prior art as a whole, or the nature of the problem itself . . . ."); *In re Hoeschele*, 406 F.2d 1403, 1406-407 (CCPA 1969) ("[I]t is proper to take into account not only specific teachings of the references but also the inferences which one skilled in the art would reasonably be expected to draw therefrom . . .").

According to *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003):

> In cases involving overlapping ranges, we and our predecessor court have consistently held that

> even a slight overlap in range establishes a *prima facie* case of obviousness . . . We have also held that a *prima facie* case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985).

"[W]here the prior art gives reason or motivation to make the claimed [invention]…the burden (and opportunity) then falls on an applicant to rebut that *prima facie* case. Such rebuttal or argument can consist of . . . any other argument or presentation of evidence that is pertinent." *In re Dillon*, 919 F.2d 688, 692-93 (Fed. Cir. 1990) (*en banc*). According to 37 C.F.R. § 41.37(c) (1)(ix) (2004):

> *Evidence appendix.* An appendix containing copies of any evidence submitted pursuant to §§ 1.130, 1.131, or 1.132 of this title or of any other evidence entered by the examiner and relied upon by appellant in the appeal, along with a statement setting forth where in the record that evidence was entered in the record by the examiner. . . .

Appellants bear the burden of showing that the claimed invention imparts unexpected results. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972) "While we do not intend to slight the alleged improvements, we do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables." *In re Dunn*, 349 F.2d 433, 439 (CCPA 1965).

Such a truly comparative showing must be derived from a comparison between the claimed subject matter and the closest prior art (*In re Baxter Tranvenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984)) and must be reasonably commensurate with the scope of protection sought by the claims on appeal (*In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035 (CCPA 1980)). *See also In re Harris*, 409 F.3d 1339, 1344 (Fed. Cir. 2005) which states:

> The Board also correctly reasoned that the showing of unexpected results is not commensurate in scope with the degree of protection sought by the claimed subject matter because the elemental composition of CMSX®-486 is at or near the midpoint of the claimed range. While Harris's evidence may show a slight improvement over some alloys, the record does not show that the improved performance would result if the weight-percentages were varied within the claimed ranges. Even assuming that the results were unexpected, Harris needed to show results covering the scope of the claimed range.

Unsworn exhibits are treated as arguments. *In re Mehta*, 347 F.2d 859, 866 (CCPA 1965). Appellants' mere arguments in the Brief or conclusory statements in the Specification cannot take the place of objective evidence. *See, e.g., In re De Blauwe*, 736 F.2d at 705; *In re Lindner*, 457 F.2d 506, 508 (CCPA 1972).

ANALYSIS AND CONCLUSION OF LAW

As correctly found by the Examiner, Maid discloses hot-rolled steel strips produced from steels containing 0.05 to 0.16% of C, 0.5 to 1.0% of Si, 0.3 to 1.5% of Cr, less than or equal to 0.025% of P, less than or equal to

0.015% of S, 0.02 to 0.1% of Al, less than or equal to 0.011% of N, 0.2 to 0.4% of Mn, and the remainder being iron and usual impurities. It can be inferred from this disclosure of Maid that its hot-rolled steel strips have N/Al weight ratios from 0.11(0.011% of N/ 0.1% of Al) to 0.55 (0.011% of N/0.02% of Al). Moreover, according to page 20 of the Specification, the employment of N in the amount taught by Maid necessarily provides the amount of N in dissolved state recited in claims 1, 2, 10, and 12.

As argued by Appellants, Maid does not specifically mention 0.45% or less Si recited in claims 1, 2, 10, 12, and 0.6 or more N/Al ratio recited in 16 through 19. However, they are very close to Maid's hot-rolled steel strips having 0.5% of Si and N/Al ratio of 0.55, respectively. The closeness of the Si proportions and N/Al ratios involved is further underscored by Appellants' statement that even "0.88 N/Al ratio is relatively close to 0.6." Thus, we concur with the Examiner that one of ordinary skill in the art would have been led to employ the claimed Si content and N/Al ratio in Maid's hot-rolled steel strips with a reasonable expectation of successfully imparting the same or substantially the same property taught by Maid. As stated in *Peterson*, 315 F.3d at 1329:

> In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a *prima facie* case of obviousness . . . . We have also held that a *prima facie* case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985).

As also argued by Appellants, Maid does not specifically mention an average ferrite grain size of 10 micrometers or less as required by claim 1. However, Maid teaches that its hot-rolled steel strips have dual-phase structures "composed of *fine-grained*, globular ferrite (>80%) and martensite grains dispersed therein" with "tensile strengths of about 500 to 600 N/mm^2." Maid also teaches that its hot-rolled steel strips are "suitable for the production of components which require high cold workability." Tosaka, which is drawn to high tensile cold-rolled steel sheets (the steel sheet art), explains that "fine" ferrite grains are defined to include grains having a mean grain diameter of 20 micrometers or less. In other words, Maid's reference to "fine" ferrite grains, as explained by Tosaka, would have conveyed to one of ordinary skill in the steel sheet art that its ferrite grains have, *inter alia*, the claimed average grain sizes (fine grain sizes). Thus, Maid would have suggested to one of ordinary skill in the art the employment of various fine ferrite grain sizes, including the claimed average ferrite grain size, in its hot-rolled steel strips. As stated in *Peterson*, 315 F.3d at 1329:

> In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a *prima facie* case of obviousness . . . .

This is especially true in this situation since according to Appellants, "there is a significant correlation between the amount of Al, the amount of dissolved N and the size of ferrite grains." As indicated *supra*, Maid teaches or suggests the claimed amounts of Al and dissolved N.

Hence, we find no reversible error in the Examiner's determination that Maid, as explained by Tosaka, would have taught and/or suggested the claimed contents of Si and dissolved N, the claimed average grain size of ferrite phase, and the claimed N/Al ratio within the meaning of 35 U.S.C. § 103(a). Having determined that the Examiner has established a prima facie case of obviousness, we look to Appellants' rebuttal evidence.

As a rebuttal to the prima facie case established by the Examiner, Appellants rely on Exhibit 1 and Figures 1 through 3 which are said to be developed from Tables 3 and 16 in the Specification to show unexpected results. The hot-rolled steel sheets listed in Tables 3 and 16 have various thicknesses and are produced from various steel alloy compositions under various processing temperatures. They, for example, contain 0.03 to 0.08% C, 0.01 to 0.45% Si, 0.9 to 2.00% Mn, 0.001 to 0.005% S, 0.004 to 0.045% P, 0.004 to 0.017% Al, and 0.001 to 0.02% N, and optionally Nb and V, with a N/Al ratio of 0.08 to 3.63. They also have unknown proportions of at least two phases selected from ferrite, pearlite, bainite, and martensite. Table 16 further shows that its hot-rolled steel sheets have 0.0002 to 0.0155 dissolved N, 0.009 to 0.08% of Nb and V, an areal rate of ferrite phase from 78 to 97%, an average ferrite grain size of 5.5 to 11.8 micrometers, and an average Nb or V carbonitride grain size of 0.02 to 0.28 micrometers. According to Appellants, the showing in Tables 3 and 16 demonstrates that hot-rolled steel sheets having Al content of less than 0.02%, N content of 0.0050 to 0.0250%, N/Al ratio of 0.3 or more, dissolved N of 0.0010% or more, and average ferrite grain size of 10 μm or less unexpectedly increase their yield point (BH) and tensile strength after aging (ΔTS). However,

Appellants, on this record, fail to demonstrate that the claimed subject matter as a whole imparts unexpected results.

First, we note that Appellants state that they are not relying on any evidence and do not provide copies of Exhibit 1 and Figures 1 through 3 derived from Tables 3 and 16 in the Evidence Appendix section. Appellants also do not provide "a statement setting forth where in the record that evidence was entered in the record by the examiner" in the Evidence Appendix section. Thus, we treat Appellants' statements directed to Exhibit 1 and Figures 1 through 3 as mere arguments unsupported by factual evidence. It is well settled that Appellants' arguments in the Appeal Brief and the Reply Brief cannot take the place of factual evidence.

Second, any factual evidence in Tables 3 and 16 does not demonstrate that the claimed features relied upon are attributable to the allegedly unexpectedly improved BH and ΔTS properties of hot-rolled steel sheets. It is not clear that the allegedly improved BH and ΔTS are due to the unclaimed different proportions of different phases in hot-rolled steel sheets, the claimed average grain sizes of the ferrite phases of hot-rolled steel sheets, the claimed N/Al ratios in hot-rolled steel sheets, the unclaimed different areal rates of ferrite phase in hot-rolled steel sheets, the unclaimed processing temperatures used to produce hot-roll steel sheets, the unclaimed amounts of Nb and V precipitated as NB and V carbonitrides and the unclaimed average Nb or V carbonitride grain sizes. The cause-and–effect relationship, which Appellants desire to show between the claimed features, such as average ferrite grain size, the claimed amount of dissolved N, and

the claimed N/Al ratio, and the allegedly improved BH and ΔTS properties of hot-rolled steel sheets, is lost in multiple unfixed variables.

Third, Appellants have not demonstrated that the allegedly improved BH and ΔTS properties of hot-rolled steel sheets are based on a comparison between the claimed invention and the closest prior art, Maid. Appellants have not explained which comparative examples and why such comparative examples in Tables 3 and 16 are representative of the closest prior art, Maid.

Finally, Appellants have not demonstrated that the showing in Tables 3 and 16 is reasonably commensurate in scope with the degree of protection sought by the claims on appeal. While the showing in Tables 3 and 16 are limited as explained above, the claims are not so limited. Appellants have not explained why the limited showing in Tables 3 and 16 is reasonably commensurate in scope with the claims on appeal.

Thus, Appellants fail to demonstrate that the claimed subject matter as a whole imparts unexpected results.

Accordingly, based on the totality of record, including due consideration of Appellants' arguments and evidence, we determine that the preponderance of evidence weighs most heavily in favor of obviousness regarding the subject matter recited in claims 1 through 5, 10, 12, and 14 through 19 within the meaning of 35 U.S.C. § 103(a).

ORDER

The decision of the Examiner is affirmed.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

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